

IN THE CLAIMS:

Please amend the claims as follows:

1. (Previously presented) A method for producing a single-crystal  $M^{III}N$  article comprising the steps of:
  - (a) providing a template material having an epitaxial-initiating growth surface;
  - (b) sputtering a Group III metal target in a plasma-enhanced environment to produce a Group III metal source vapor;
  - (c) combining the Group III metal source vapor with a nitrogen-containing gas to produce a reactant vapor species comprising Group III metal and nitrogen; and
  - (d) depositing the reactant vapor species on the growth surface to produce a single-crystal  $M^{III}N$  layer thereon having a thickness of greater than approximately 10 microns.
2. (Original) The method according to claim 1 wherein the template material comprises a component selected from the group consisting of sapphire, silicon, silicon carbide, diamond, lithium gallate, lithium aluminate, ScAlMg, zinc oxide, spinel, magnesium oxide, gallium arsenide, glass, tungsten, molybdenum, hafnium, hafnium nitride, zirconium, zirconium nitride, carbon, silicon-on-insulator, carbonized silicon-on-insulator, carbonized silicon-on-silicon, and gallium nitride.

3. (Original) The method according to claim 1 wherein the template material is selected from the group consisting of conductive substrates, insulating substrates, semi-insulating substrates, twist-bonded substrates, compliant substrates, or patterned substrates.
4. (Original) The method according to claim 1 wherein the template material has a thermal coefficient of expansion substantially equal to the  $M^{III}N$  layer.
5. (Original) The method according to claim 1 wherein the template material has a diameter of approximately 0.5 inch or greater.
6. (Original) The method according to claim 1 wherein the Group III metal target comprises a component selected from the group consisting of gallium, indium, aluminum, and binary, ternary, and quaternary alloys and compounds thereof.
7. (Original) The method according to claim 1 wherein the nitrogen-containing gas includes species selected from the group consisting of diatomic nitrogen, atomic nitrogen, nitrogen ions, partially ionized nitrogen, ammonia, nitrogen-containing compounds, and combinations thereof.

8. (Original) The method according to claim 1 wherein the reactant vapor species is deposited directly on the template material.
9. (Original) The method according to claim 1 comprising the step of depositing an intermediate layer on the template material prior to depositing the reactant vapor species.
10. (Original) The method according to claim 9 wherein the intermediate layer comprises a material selected from the group consisting of GaN, AlN, InN, ZnO, SiC, and alloys thereof.
11. (Original) The method according to claim 9 wherein the intermediate layer comprises SiO<sub>2</sub>, Si<sub>x</sub>N<sub>y</sub>, diamond, lithium gallate, lithium aluminate, zinc oxide, spinel, magnesium oxide, gallium arsenide, tungsten, molybdenum, hafnium, hafnium nitride, zirconium, zirconium nitride, and carbon.
12. (Original) The method according to claim 9 wherein the intermediate layer is deposited by causing lateral epitaxial overgrowth of the intermediate layer on the growth surface.

13. (Original) The method according to claim 9 wherein the intermediate layer comprises more than one layer.
14. (Currently amended) The method according to claim 9 wherein the intermediate layer is deposited by a technique selected from the group consisting of physical vapor deposition, sputtering, molecular beam epitaxy, atmospheric chemical vapor deposition, low pressure chemical vapor deposition, plasma-enhanced chemical vapor deposition, metalorganic ~~metallorganic~~ chemical vapor deposition, evaporation, sublimation, and hydride vapor phase epitaxy.
15. (Canceled)
16. (Original) The method according to claim 1 comprising the step of doping the  $M^{III}N$  layer.
17. (Original) The method according to claim 1 wherein the  $M^{III}N$  layer is formed at a growth rate of approximately 10 microns/hour or greater.
18. (Previously presented) The method according to claim 59 wherein the  $M^{III}N$  article is provided in a form selected from the group consisting of

intrinsic  $M^{III}N$ , doped  $M^{III}N$ , and  $M^{III}N$  alloys and compounds containing greater than 50%  $M^{III}$  and N.

19. (Previously presented) The method according to claim 59 wherein the  $M^{III}N$  article has a diameter of approximately 2 inches or greater and a thickness of approximately 1 mm or greater.
20. (Previously presented) The method according to claim 59 wherein the template material is removed by a removal technique selected from the group consisting of polishing, chemomechanical polishing, laser-induced liftoff, cleaving, wet etching, and dry etching.
21. (Previously presented) The method according to claim 59 comprising the step of cutting a wafer from the  $M^{III}N$  article.
22. (Previously presented) The method according to claim 59 comprising the step of preparing a surface of the  $M^{III}N$  article for epitaxial growth thereon.
23. (Previously presented) The method according to claim 59 comprising the step of depositing an epitaxial layer on the  $M^{III}N$  article.

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24. (Previously presented) The method according to claim 59 comprising the step of forming a device on the  $M^{III}N$  article.

25-31. (Canceled)

32. (Currently amended) The method according to claim 62 wherein the additional reactant species are deposited by a technique selected from the group consisting of physical vapor deposition, sputtering, molecular beam epitaxy, atmospheric chemical vapor deposition, low pressure chemical vapor deposition, plasma-enhanced chemical vapor deposition, metalorganic ~~metallorganic~~ chemical vapor deposition, evaporation, sublimation, and hydride vapor phase epitaxy.

33. (Previously presented) The method according to claim 62 comprising the step of cutting a wafer from the bulk  $M^{III}N$  article.

34. (Original) The method according to claim 33 comprising the step of preparing a surface of the wafer for epitaxial growth thereon.

35. (Original) The method according to claim 34 comprising the step of depositing an epitaxial layer on the wafer.

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36. (Original) The method according to claim 33 comprising the step of forming a device on the wafer.
37. (Previously presented) A bulk single-crystal  $M^{III}N$  article produced according to the method of claim 59 wherein the article has a thickness of approximately 50 microns or greater.
38. (Previously presented) A single-crystal  $M^{III}N$  article produced according to the method of claim 59, wherein the article is in wafer form having a thickness ranging from approximately 50 microns to approximately 1 mm.
39. (Previously presented) A single-crystal  $M^{III}N$  article produced according to the method of claim 59, wherein the article is in boule form having a diameter of approximately 2 inches or greater and a thickness ranging from approximately 1 mm to greater than approximately 100 mm.
40. (Currently amended) A method for producing a single-crystal  $M^{III}N$  article comprising the steps of:
- (a) providing a template material having an epitaxial-initiating growth surface;

- (b) using a sputtering apparatus comprising a non-thermionic electron/plasma injector assembly to produce a Group III metal source vapor from a Group III metal target;
  - (c) combining the Group III metal source vapor with a nitrogen-containing gas to produce a reactant vapor species comprising Group III metal and nitrogen; and
  - (d) depositing the reactant vapor species on the growth surface to produce a single-crystal  $M^{III}N$  layer thereon having a thickness of greater than approximately 10 microns.
41. (Original) The method according to claim 40 wherein the injector assembly comprises a plurality of hollow cathode injectors disposed in fluid communication with a gas source, each injector including an orifice communicating with a sputtering chamber.
42. (Original) The method according to claim 40 wherein the injector assembly comprises:
- (a) a main body having a generally annular orientation with respect to a central axis and including a process gas section and a cooling section, the process gas section defining a process gas chamber and the cooling section defining a heat transfer fluid reservoir; and



- (b) a plurality of gas nozzles removably disposed in the main body in a radial orientation with respect to the central axis and in heat transferring relation to the heat transfer fluid reservoir, each gas nozzle providing fluid communication between the process gas chamber and a region exterior to the main body.
43. (Original) The method according to claim 40 comprising the step of removing the template material, thereby providing a free-standing, single-crystal  $M^{III}N$  article.
44. (Previously presented) A bulk single-crystal  $M^{III}N$  article produced according to the method of claim 40 wherein the article has a thickness of approximately 50 microns or greater.
45. (Original) A single-crystal  $M^{III}N$  article produced according to the method of claim 40, wherein the article is in wafer form having a thickness ranging from approximately 50 microns to approximately 1mm.
46. (Original) A single-crystal  $M^{III}N$  article produced according to the method of claim 40, wherein the article is in boule form having a diameter of approximately 2 inches or greater and a thickness ranging from approximately 1mm to greater than approximately 100mm.

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47. (Original) A single-crystal  $M^{III}N$  article produced according to the method of claim 40 at a growth rate greater than approximately 10 microns/hour.
48. – 56. (Canceled)
57. (Previously presented) The method according to claim 1 wherein the  $M^{III}N$  layer has a diameter of approximately 0.5 inch or greater.
58. (Previously presented) The method according to claim 1 wherein the  $M^{III}N$  layer is provided in a form selected from the group consisting of intrinsic  $M^{III}N$ , doped  $M^{III}N$ , and  $M^{III}N$  alloys and compounds containing greater than 50%  $M^{III}$  and N.
59. (Previously presented) The method according to claim 1 comprising the steps of continuing to deposit the reactant vapor species on the growth surface whereby the  $M^{III}N$  layer attains a thickness sufficient to enable removal of the template material, and removing the template material to provide a free-standing, single-crystal  $M^{III}N$  article.
60. (Previously presented) The method according to claim 59 wherein the  $M^{III}N$  article has a thickness of approximately 50 microns or greater.

61. (Previously presented) The method according to claim 60 wherein the  $M^{III}N$  article has a diameter of approximately 0.5 inch or greater.
62. (Currently amended) A method for producing a bulk single-crystal  $M^{III}N$  article comprising the steps of:
- (a) providing a template material having an epitaxial-initiating growth surface;
  - (b) sputtering a Group III metal target in a plasma-enhanced environment to produce a Group III metal source vapor;
  - (c) combining the Group III metal source vapor with a nitrogen-containing gas to produce a reactant vapor species comprising Group III metal and nitrogen;
  - (d) depositing the reactant vapor species on the growth surface to produce a single-crystal  $M^{III}N$  layer thereon; and
  - (e) using the single-crystal  $M^{III}N$  layer as a seed crystal to grow a bulk  $M^{III}N$  layer having a thickness of greater than approximately 10 microns by depositing additional reactant vapor species comprising a Group III metal and nitrogen on the seed crystal.
63. (Previously presented) A bulk single-crystal  $M^{III}N$  article produced according to the method of claim 62 wherein the article has a thickness of approximately 50 microns or greater.

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64. (Previously presented) A single-crystal  $M^{III}N$  article produced according to the method of claim 62, wherein the article is in wafer form having a thickness ranging from approximately 50 microns to approximately 1 mm.
65. (Previously presented) A single-crystal  $M^{III}N$  article produced according to the method of claim 62, wherein the article is in boule form having a diameter of approximately 2 inches or greater and a thickness ranging from approximately 1mm to greater than approximately 100 mm.
66. (Previously presented) The method according to claim 40 comprising the step of using the single-crystal  $M^{III}N$  layer as a seed crystal and depositing additional reactant vapor species comprising a Group III metal and nitrogen on the  $M^{III}N$  layer to produce a bulk  $M^{III}N$  article.
67. (Canceled)